ACUTE TOXICITY OF CURASOL AH TO SELECTED FISH AND AQUATIC INVERTEBRATES TECHNICAL BULLETIN 2-74

Ontario

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SUMMARY

A series of short-term toxicity tests were conducted on three fish species (*Lebistes reticulatus*, *Pimephales promelas*, *Salmo gairdneri*), and two aquatic invertebrates (*Daphnia pulex*, *Hyalella azteca*) to evaluate potential toxicity of Curasol AH. Curasol is recommended by the manufacturer as a soil stabilizer to prevent physical soil erosion.

No adverse effects were observed on daphnid survival, growth and hatchability up to 10 mg/l. Equally favourable results were obtained when leachate from simulated field applications was tested with *D. Pulex* and *Hyalella azteca*.

The results of the study also indicate low acute toxicity levels for the fish species tested. It is unlikely that acutely toxic conditions would result from field use of Curasol AH, providing that recommended application practices are maintained.

INTRODUCTION

A series of short-term toxicity texts were conducted to determine potential toxicity of Curasol AH. This material, when applied at the recommended rate, is considered effective in checking soil erosion, and the manufacturer (Hoechst Chemicals) plans to market is as a multiple-use soil stabilizer. The recommended method of application is by sprayer and is normally restricted to a single dosage of 330 - 440 lbs. per acre frequently combined with mulching and some form of fertilizing.

Very little information was available from the manufacturer regarding chemical characteristics of the compound, except that it is not water-soluble, contains about 50% solids, 0.5% volatile compounds and traces of antibiotics. Due to the limited chemical data, determination of the toxic properties of Curasol was deemed essential to evaluate its significance as a possible water contaminant.

METHODS AND MATERIALS

Dechlorinated tapwater was used in all tests; chemical characteristics of the water are shown in Table 1.

All fish toxicity tests were undertaken using predetermined concentration ranges of the toxicant. Guppies (Lebistes reticulatus), fathead minnows (Pimephales promelas) and rainbow trout (Salmo gairdneri) were used to establish critical concentration ranges. Due to their large size, existing stocks of rainbow trout proved unsuitable for intensive toxicity work, however, LC_{50} values were determined for fathead minnows. During the test periods temperatures ranged from 21.0° - 22.0°C for minnows and guppies; 18.0 - 19.0°C for rainbow trout. Dissolved oxygen concentrations were in excess of 50% of saturation levels, except for minnow tests conducted without artificial aeration where only marginal levels were achieved (30%). Maximum loading was approximately 0.80 grams of fish per liter of test solution and all fish were acclimated to test conditions and starved according to generally accepted testing procedures (Sprague, 1969).

Invertebrate testing consisted of a series of exposures with predetermined concentration ranges, as well as a number of tests on leachate derived from a soil bed to which Curasol had been applied at the recommended rate (440 lbs/acre), and which was exposed to a ½ inch of simulated rainfall over a 30 minute period. Experiments were conducted with laboratory-reared daphnia (D. pulex)at 19°C for 13 days and observations were made on survival, growth and reproduction. Five daphnids less than 24 hours old were used in each test container; otherwise test methods of Biesinger and Christensen (1972) were used. Adult amphipods (Hyalella azteca) were tested for 27 days at 19°C, and the same responses were measured. Test solutions were not renewed and animals were fed throughout the test period.

RESULTS AND DISCUSSION

Fish toxicity data are summarized in Table 2. Separate LC_{50} values were obtained for fathead minnows in aerated and non-aerated conditions since aeration of the test liquids induced precipitation of Curasol and changed the characteristic adhesive qualities of the material. Reduced mortalities were clearly associated with the aerated tests. Whether this was due to an improved dissolved oxygen regime, precipitation of the toxicant, or both, is not clear. It is difficult to speculate on the presence of an active toxic ingredient, particularly when the adhesive character of Curasol is recognized. The possibility of impaired respiration due to clogging of gill surfaces should be emphasized.

No adverse effects were observed on invertebrate survival, growth and hatchability within the concentration ranges tested. Young daphnids (less than 24 hours old) grew well and reproduced viable offspring in concentrations up to 10 mg/l. Equally favourable results were obtained when leached material from simulated field application was tested with D. pulex and Hyalella azteca.

In assessing toxicity potential, a clear distinction has to be made between effects resulting from normal use of a material and direct, accidental contamination of surface waters. However, one can only speculate on the effect of direct contamination since concentrations of the toxicant encountered would be highly variable depending on dilution and dosages applied. Under the worst conditions imaginable, for example a shallow, stagnant pond of about 2 ft. depth, concentrations of Curasol would not likely exceed 70 mg/l, assuming normal application rates. Critical concentration range values for rainbow trout obtained in preliminary testing were slightly lower than those for fathead minnows, suggesting somewhat greater sensitivity amongst salmonid species. While it would have been preferrable to establish LC_{50} values for trout, a suitable supply was unfortunately not available at the time of testing. However, the differences between the two species are not great.

The results of the study indicate low acute toxicity levels for the fish species tested and no measurable adverse effects on

invertebrates under simulated field conditions. It is unlikely that acutely toxic conditions would result from field use of Curasol, providing that recommended application practices are maintained.

TABLE I: CHEMICAL CHARACTERISTICS OF TEST WATER

TOTAL HARDNESS (mg/liter as $CaCo_3$)	136
CALCIUM HARDNESS (mg/liter)	42
TOTAL ALKALINITY (mg/liter as $CaCo_3$)	87
CHLORIDE (as Cl^-)	32
CONDUCTIVITY (micromhos)	350
pH	7.4

TABLE 2: RESULTS OF 96 HOUR STATIC BIOASSAYS CONDUCTED WITH CURASOL AH

TEST ORGANISM	EFFECT	CONCENTRATION mg/liter
FATHEAD MINNOWS - AERATED	LC_{50}	280
FATHEAD MINNOWS - NON AERATED	LC_{50}	132
RAINBOW TROUT	TOTAL MORTALITY	150
GUPPIES	NON-TOXIC	1000

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